

114. *On the Mode of Gemmation in Dictyostyela*
DEPRESSA n.g. n.sp. (*Ascidiae Sociales*)

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On the 8th of last May (1926) I received from Prof. N. Yatsu, of the Imperial University, Tokyo, an empty shell of *Haliotis gigantea* Chemn., the outer surface of which was covered with what appeared to be an aggregation of small simple Ascidians. As the form was unknown to me, I at once commenced to study it in detail, and soon found out that the animal formed a real colony, the individuals being organically connected with one another by means of a stolon-like structure. I give here a short description of this remarkable Ascidian, with some notes on the mode of gemmation, which differs considerably from that of other genera of the so-called *Ascidiae Sociales*.

Dictyostyela depressa n.g. n.sp.

The Colony consists of a large number of separate Ascidiozooids united with one another by the thin spreading edges of the test. Near the margin of the colony, where the Ascidiozooids are smaller and more widely separated, the vascular connection between adjacent individuals is clearly visible in the form of stolon-like tubes traversing the test substance.

The Ascidiozooids are ovate in outline and greatly depressed antero-posteriorly. They vary in size from 2 mm. to 4 or 4.5 mm. in greatest diameter, the smaller ones being mostly placed along the margins of the colony. The upper surface is convex, even and smooth. The branchial and atrial apertures, both situated near the middle, are conspicuous, but they are not distinctly lobed. The colour in life is brick-red.

The Test is thin but tough and leathery as in some species of *Styela*. Around the base of attachment it is spread out in the form of irregularly shaped thin edges traversed by numerous blood-vessels which terminate there in elongated swollen bulbs.

The Mantle is thin and delicate. Its musculature is feebly developed.

The Branchial Sac is large and well developed, but has no folds. The internal longitudinal bars are numerous and strong. The transverse vessels are all of the same size. The meshes are elongated longitudinally, and contain each about four long narrow stigmata.

The Dorsal Lamina is a plain narrow membrane.

The Tentacles are about sixteen in number ; they are all simple and nearly of the same size.

The Dorsal Tubercle is small, and has an inconspicuous oval aperture placed close to the anterior end of the dorsal lamina.

The Alimentary Canal is moderately large. The stomach is pyriform, with about ten longitudinal folds upon its side. It tapers gradually into the intestine, which turns anteriorly and then dorsally and runs alongside the anterior edge of the stomach so as to form a very narrow loop. The system of glandular tubules is well developed, and covers the greater part of the intestinal wall.

The Reproductive Organs are in the form of polycarps which project from the inner surface of the mantle. There are about equal number of these organs on both sides of the body. Endocarps are also present.

Tailed Larvae of large size are present in abundance in the peribranchial cavities of most of the Ascidiozooids. They have short ovate bodies and very large broad tails. Adhering papillae are present at the anterior end of the body, and the single pigmented sense-organ is situated a short distance behind them.

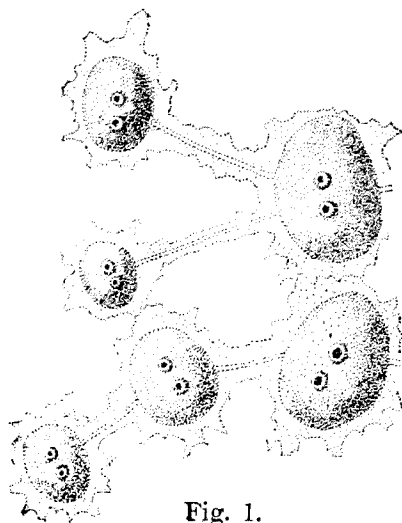


Fig. 1.

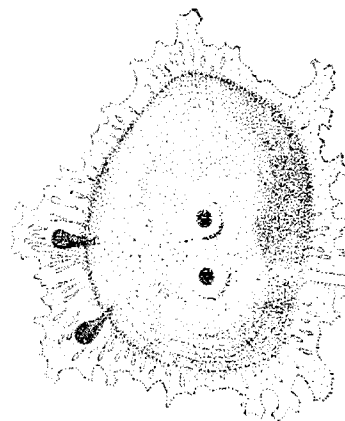


Fig. 2.

Fig. 1. *Dictyostyela depressa*, part of a colony. $\times 4$

Fig. 2. " " an ascidiozooid with two buds. $\times 10$

As will be seen from the above description, the new genus is closely related to *Synstyela* so far as the structure of the Ascidiozoid is concerned. From the latter genus as well as from *Goodsiria*, it can easily be distinguished by the wholly different aspect of the colony.

The mode of gemmation in the present genus is very interesting. The buds are not formed, as in the case of *Clavelina* and *Perophora*, from the creeping stolon, but directly from the lateral region of the parent Ascidiozoid. In this respect our animal exactly agrees with the Botryllidae, i.e. they both reproduce by pallial budding. The buds arise, in both cases, as diverticula of the atrial cavity on its ventral side, and form hollow vesicles consisting of outer ectoderm of the body, ectodermal lining of the atrial cavity and interposed mesoderm. In the present genus, however, the buds do not remain in close contact with the parent, as in the latter family, but, as they increase in size, they gradually move away from the older Ascidiozoid, leaving behind them the tubular structure somewhat resembling the creeping stolon of other social Ascidians. It is true that the pharynx of the bud soon loses its connection with the atrium of the parent, but the outer ectodermal connection persists and becomes an elongated and slender tube by which the vascular systems of the parent and bud remain in continuity. The result is that the colony presents a somewhat reticulated appearance so long as the meshes bounded by these tubes are not completely filled up by the spreading test margin of the Ascidiozooids. Where the test margins of neighbouring individuals overlap each other, the tubular structure in question usually becomes inconspicuous and can easily be overlooked.

The peculiar type of budding described above, which may be termed "pseudo-stolonial," seems to throw some light upon the nature of colony formation in certain genera of Ascidians in which the existence of asexual reproduction has hitherto remained doubtful. One of such genera is *Stolonica*, established by LACAZE-DUTHIERS and DELAGE¹⁾ in 1892. Although the authors described it as forming colonies by gemmation, most of the later investigators seem to doubt the occurrence of asexual reproduction in this form, regarding the assemblage of individuals as a mere aggregation. DELAGE²⁾ himself, in a later work, declares that *Stolonica* does not produce buds and that the former

1) LACAZE-DUTHIERS et Y. DELAGE. Faune de Cynthiades de Roscoff et des côtes de Bretagne. Mém. prés. Acad. France, Vol. XLV. 1892.

2) DELAGE, Y. Traité de Zoologie Concrète. 1893.

statement was based on a mistake in observation. SEELIGER¹⁾ is inclined to believe that the genus does not form colonies on the ground that, if budding ever occurs, it must be of the pallial type, and not stolonial as given in the original description by the authors. In view of the occurrence of pseudo-stolonial budding in *Dictyostyela*, it appears highly probable that *Stolonica* also reproduces by means of this peculiar mode of gemmation and afterward loses by atrophy the stolon-like tubes which connected the different Ascidiozooids of the colony.

1) SEELIGER, O. Tunicata in: Bronn's Klassen und Ordnungen des Tierreichs. 1893-1903.